

Medical Trade Area Analysis and Mapping Project

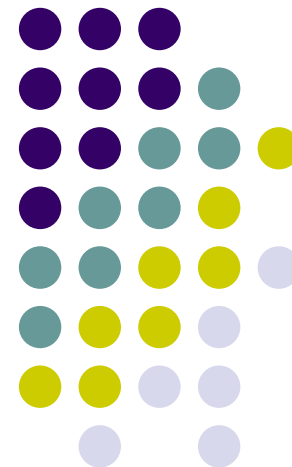
Ray Austin, PhD

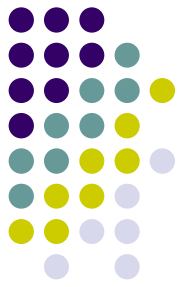
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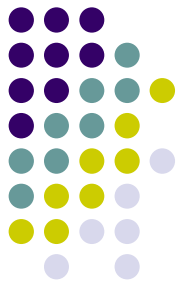
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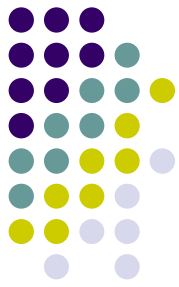
Kentucky e-Health Network

- Primary goal of the Kentucky e-Health Network
 - To facilitate the delivery of appropriate and cost efficient health care services through the development of health information exchange capabilities
- Purpose of Medical Trade Area analysis project
 - To provide information that will assist in the development of Regional Health Information Exchanges or Health Information Exchanges (RHIOs or HIEs) in Kentucky
 - Anticipated that RHIOs or HIEs will become a focal point for facilitating and coordinating the electronic exchange of health care information within MTAs



Medical Trade Area (MTA)

- Defined as a largely self-organizing geographic market area in which delineated populations of patients and providers routinely receive and deliver most healthcare services
- MTA identification takes into account:
 - Geographic origins of patients seeking health care services
 - Geographic areas served by particular health care providers rendering health services



Purpose of MTA Analysis Project

To be clear:

- The purpose of the MTA analysis project is **NOT** to define boundaries of the RHIOs and HIEs in Kentucky

Rather, it is to:

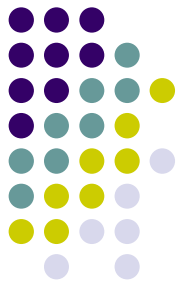
- Provide information that can be used by the Kentucky Healthcare Infrastructure Authority and Kentucky e-Health Network Board and its committees as they make recommendations and decisions about defining the boundaries and functions of Kentucky's RHIOs and HIEs

Considerations in Forming RHIOs and HIEs



Determining geographic areas where:

- There is a commonality of interests and mutual dependencies related to the exchange of health care information
 - Includes recognition of traditional referral patterns & various 'preference' considerations of stakeholders
- The volume of business provides the basis for the development of viable and financially sustainable RHIOs and HIEs
- There needs to be a compelling value proposition



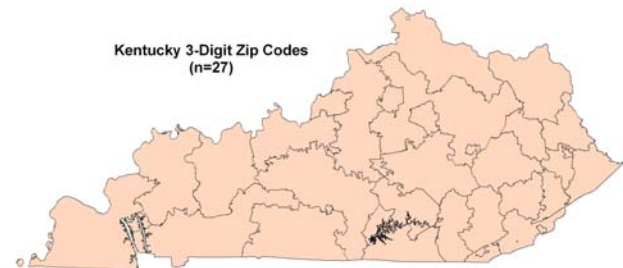
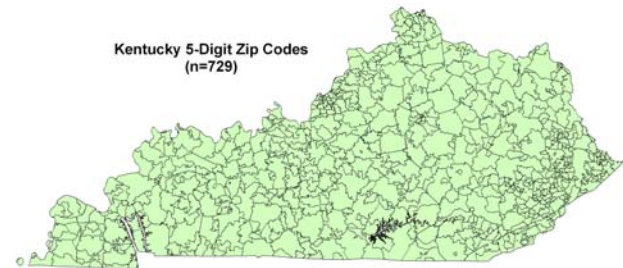
To This End

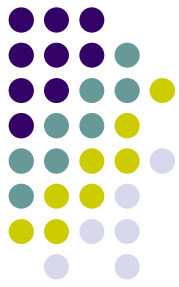
- An important starting point is identifying the prevailing geographic patterns of patient and health care provider interactions
- MTA mapping project uses a computer based *Geographic Information System (GIS)*
- GIS uses a geo-referenced relational database to analyze and display geographic patterns of patient and health provider interactions

Geographic Unit of Analysis: Kentucky Counties*



- 5-Digit Zip Codes
 - Change over time
 - Cross county boundaries
 - Subject to typing errors
- 3-Digit Zip Codes
 - n=27
 - Less geographic precision than counties
- Counties*
 - n=120
 - Stable
 - Better quality control





Sources of Data

- Kentucky Medicaid Claims Data (de-identified)
 - Fee for service
 - 2006
 - Cross-border data for Kentucky patients
- Kentucky Hospital Association (KHA) Patient Origin Data
 - 2006
 - Cross-border data
- Commercial Insurers
 - Humana
 - Anthem BC/BS
 - Bluegrass Family Health
 - Others

Current Status of the MTA Mapping Project

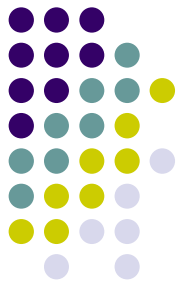


- Completing the initial 'Pilot Test' of the GIS mapping with the State Medicaid Data
- Preliminary mapping of Kentucky Hospital Association patient origin data
- Data requests to the commercial health insurers

Medicaid Claims Data Pilot Test – Data



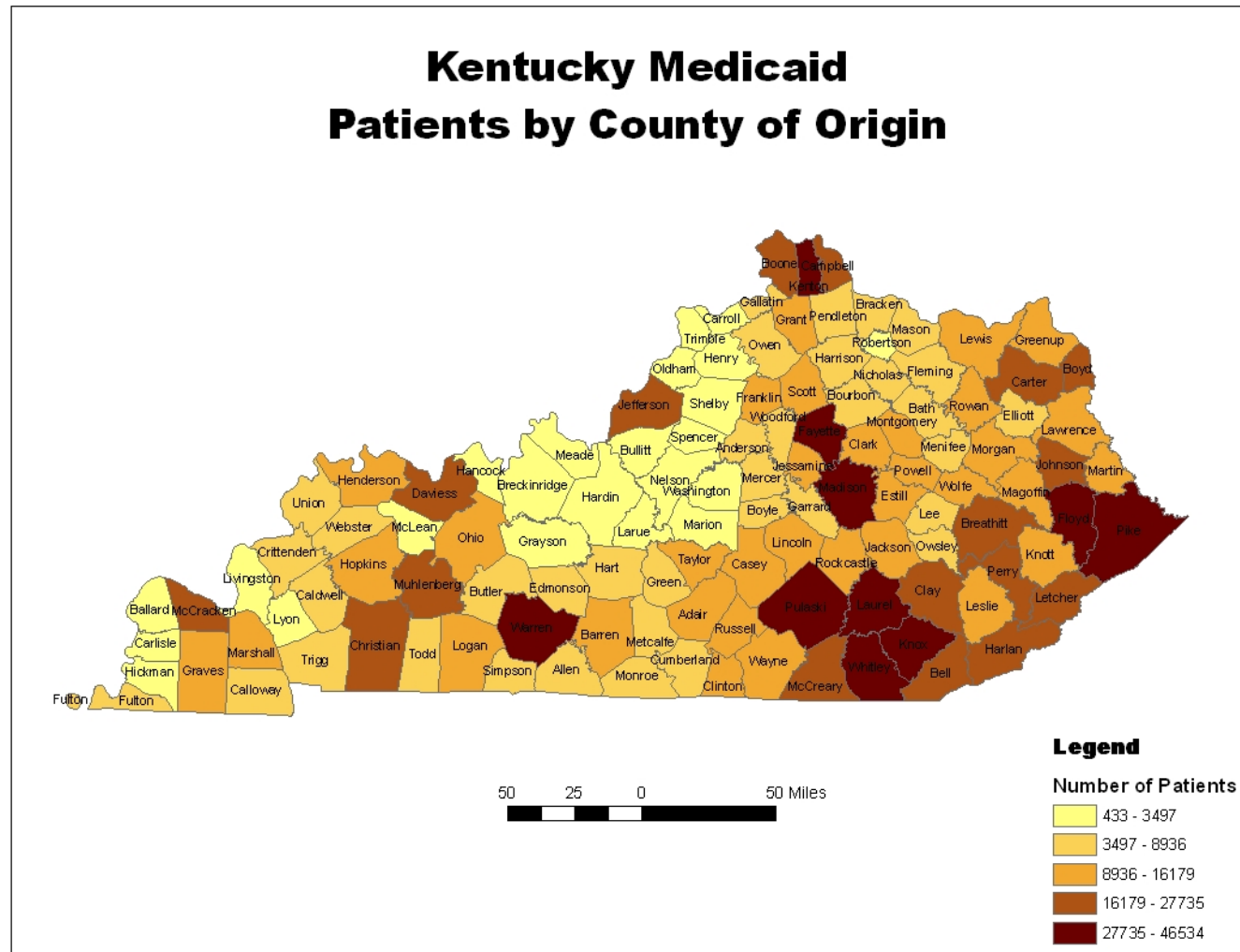
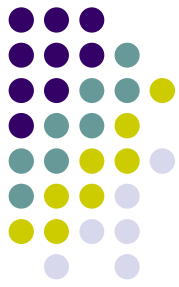
- 9610 county-to-county records (KY only)
- 4366 county-to-zip code records (for out-of-state destinations)
 - Assigned county codes
- → 10295 county-to-county records (KY and out-of-state)
- Fields: member county, provider county, no. members (unduplicated)



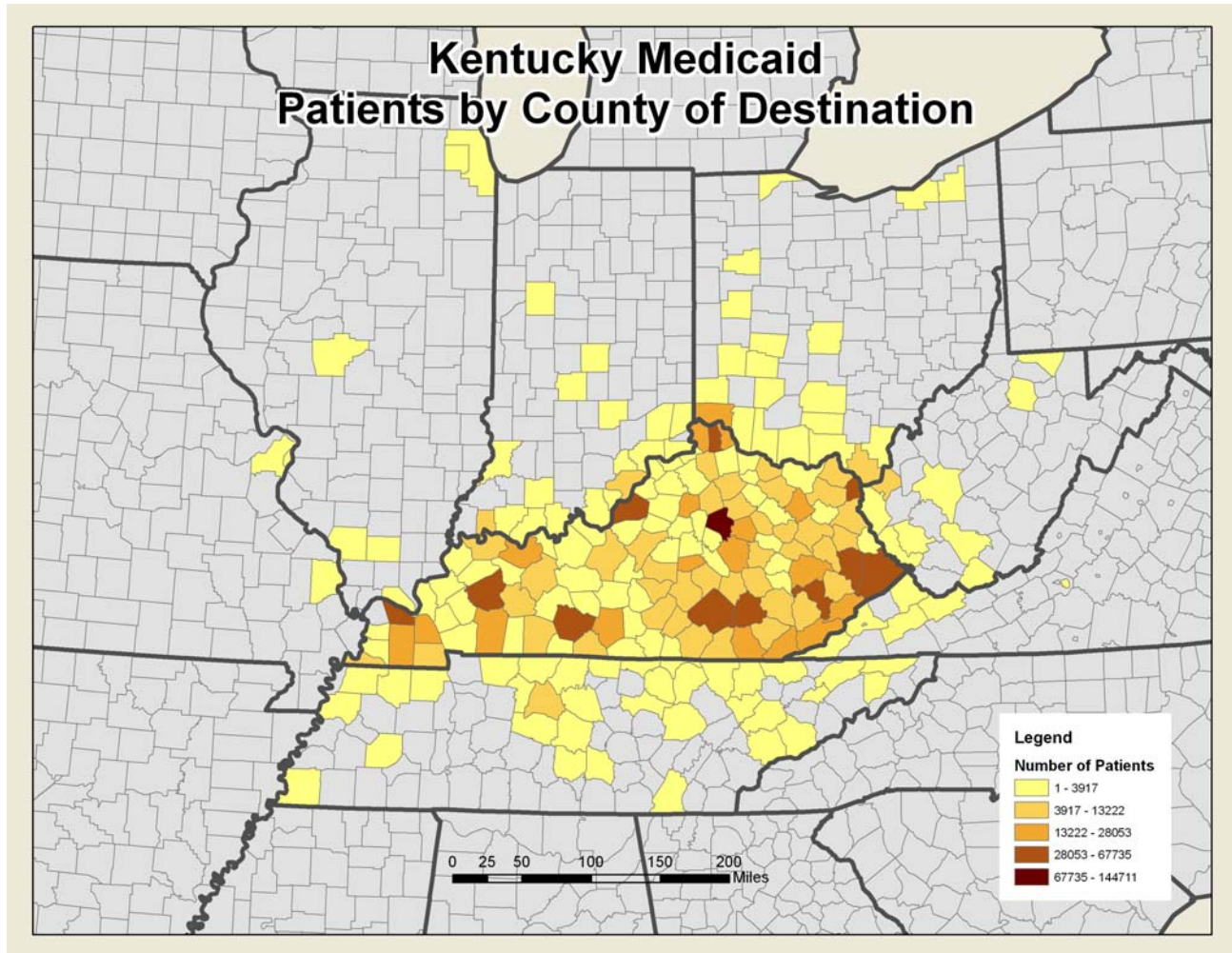
Medicaid Claims Data Pilot Test – Methods

- Choropleth Mapping
 - Patient origin
 - Patient destination
- Thiessen polygons
- Patient flows
- Gravity model (spatial interaction)
- Process is iterative

Medicaid Claims Data Pilot Test – Mapping



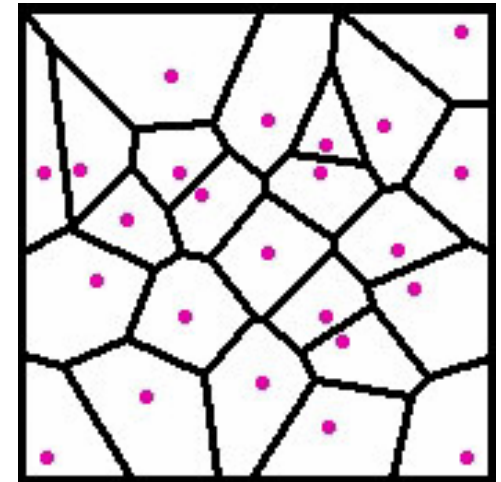
Medicaid Claims Data Pilot Test – Mapping



Medicaid Claims Data Pilot Test – Thiessen Polygons



- Define individual areas of influence around each of a set of points
- Boundaries define the area that is closest to each point relative to all other points
- Mathematically defined by the perpendicular bisectors of the lines between all points

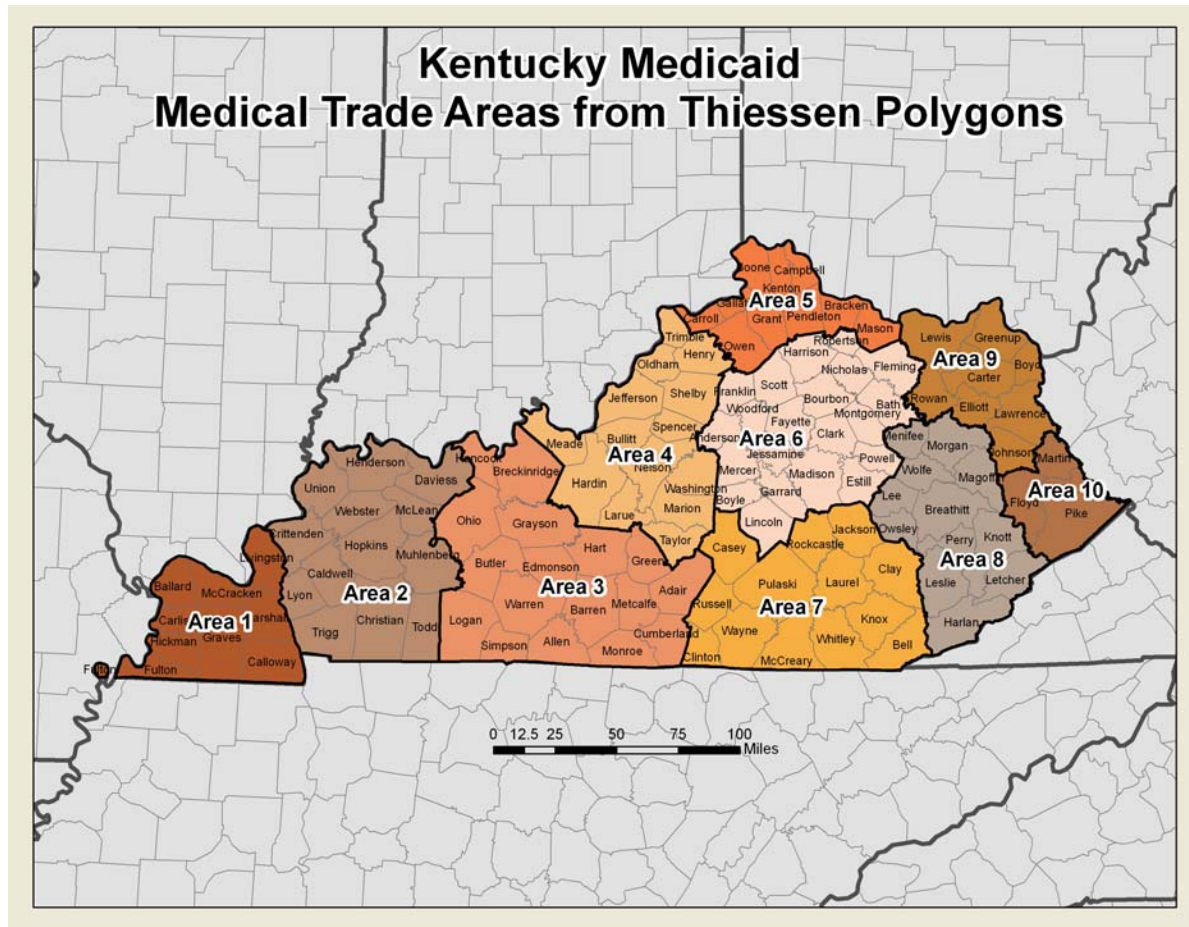


Source: <http://www.bbc.co.uk/dna/h2g2/A901937>

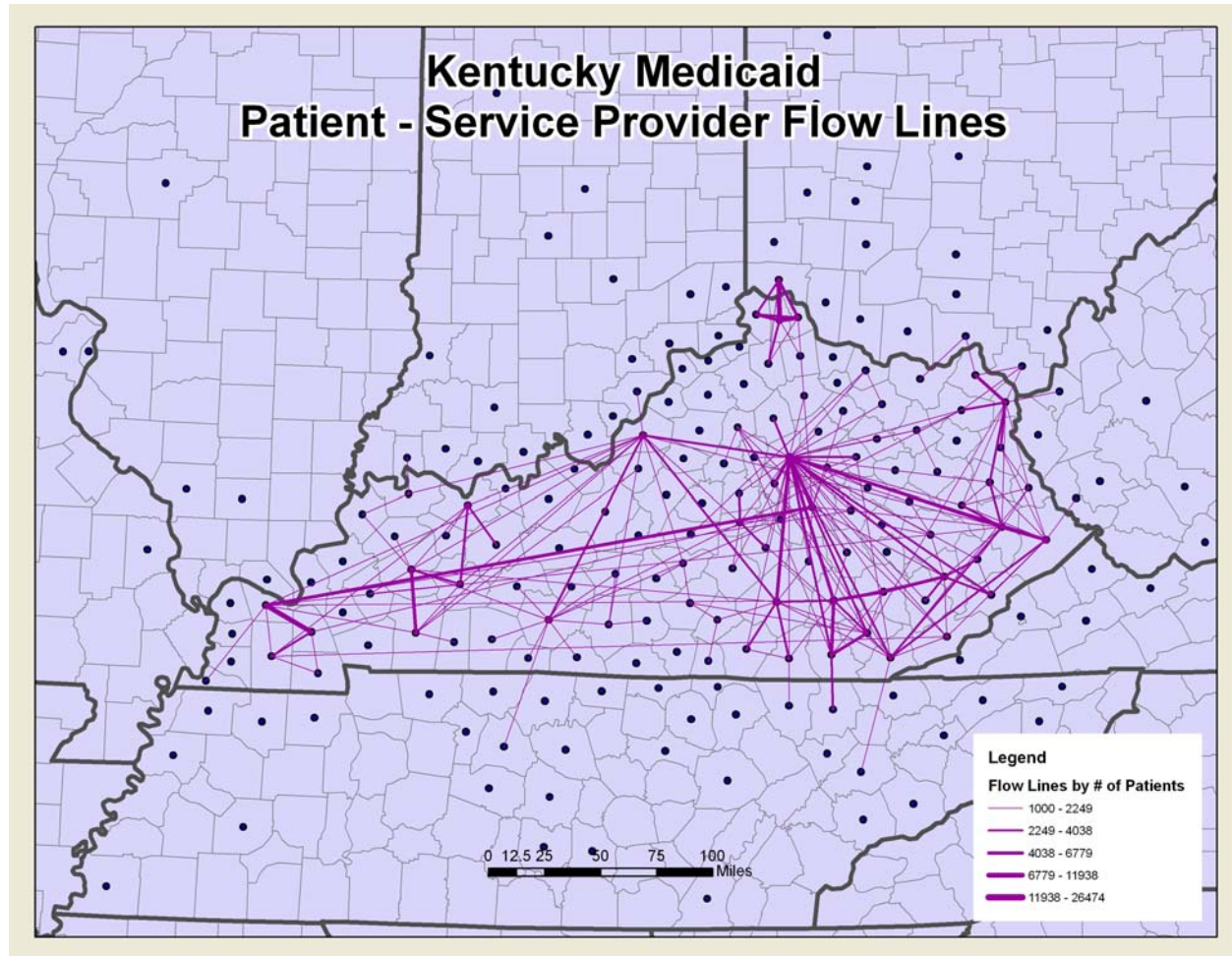
A decorative graphic in the top right corner consisting of a grid of colored dots. The dots are arranged in a roughly triangular shape, with colors ranging from dark purple to light blue and yellow. The colors transition from dark purple on the left to light blue and yellow on the right, with some dots in the center being a mix of these colors.



Medicaid Claims Data Pilot Test – Thiessen Polygons



Medicaid Claims Data Pilot Test – Patient Flows



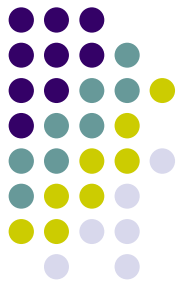
Medicaid Claims Data Pilot Test – Gravity Model



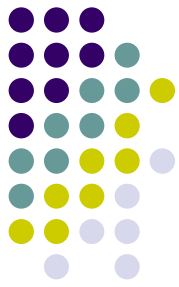
- Gravity Model (spatial interaction)
 - The closer things are together in space, the more likely interaction among them is
 - Strength/amount of interaction between two places determined by multiplying their population (or patient care transactions) and dividing by the squared distance between them

$$\frac{\text{population}_1 \times \text{population}_2}{\text{distance}^2}$$

Medicaid Claims Data Pilot Test – Gravity Model



- Area 5 example – 2 handouts
 - Major patient flows among Area 5 counties
 - Spatial interaction among Area 5 counties
- Spatial interaction greatest among Boone, Kenton, Campbell counties
- Results important for placement of fringe counties into appropriate MTAs



KHA Patient Origin Data

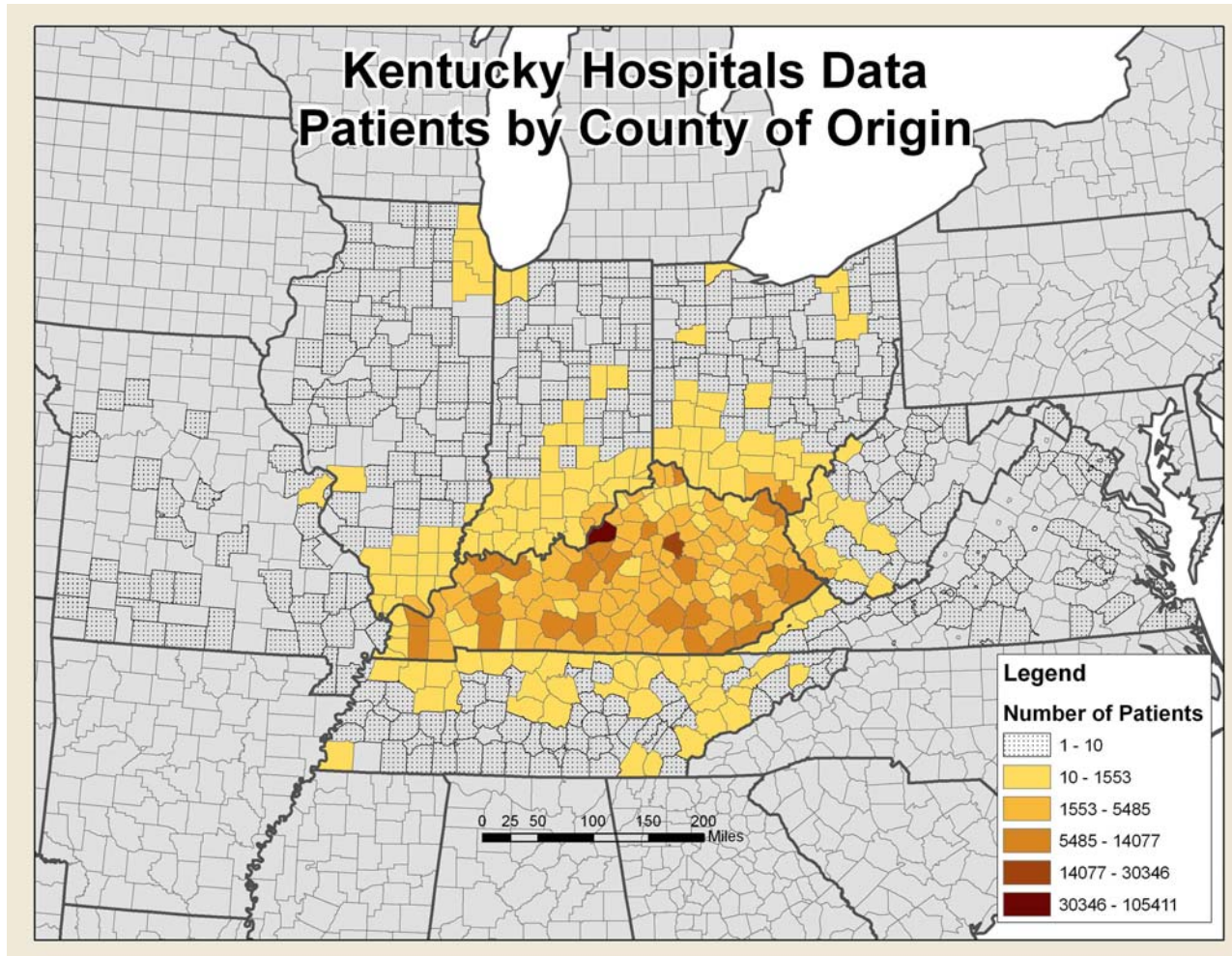
- 5693 county-to-county records (hospital county, patient county)
- Does not include St Elizabeth hospitals in Grant and Kenton counties due to problems with their data
- Out-of-state origin data
- No out-of-state destination data (opposite of Medicaid claims)

KHA Patient Origin Data Methods

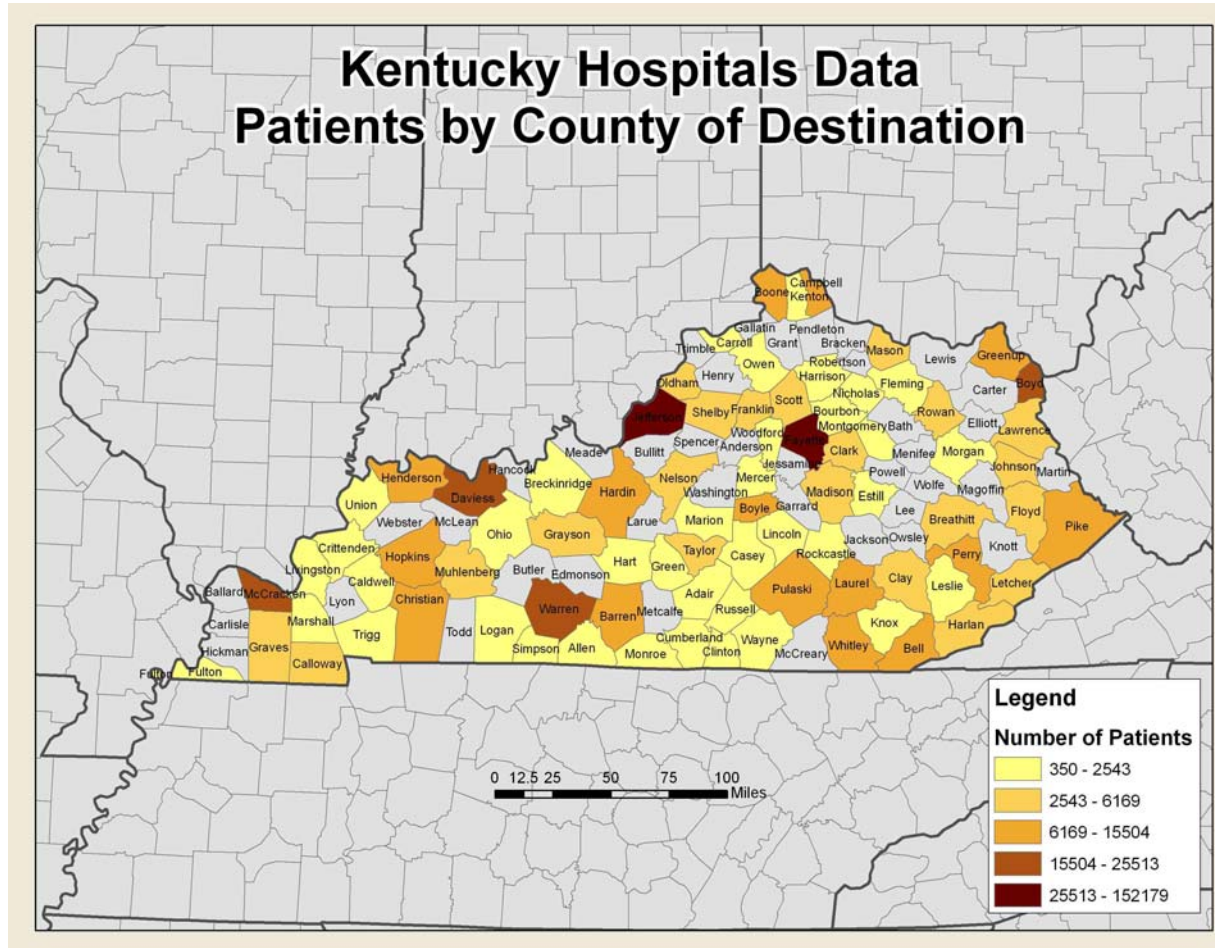


- Choropleth Mapping
 - Patient origin
 - Patient destination

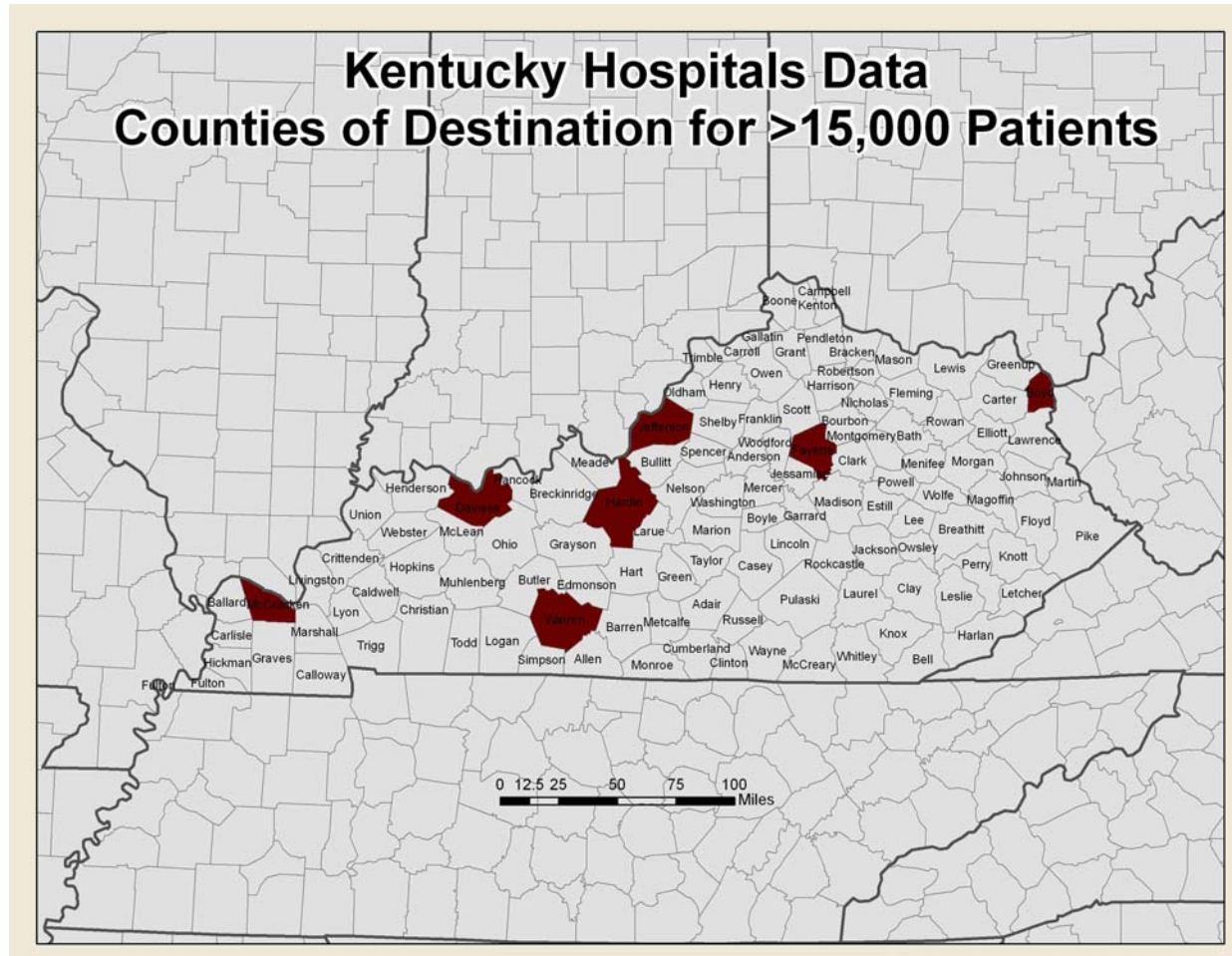
KHA Patient Origin Data Mapping



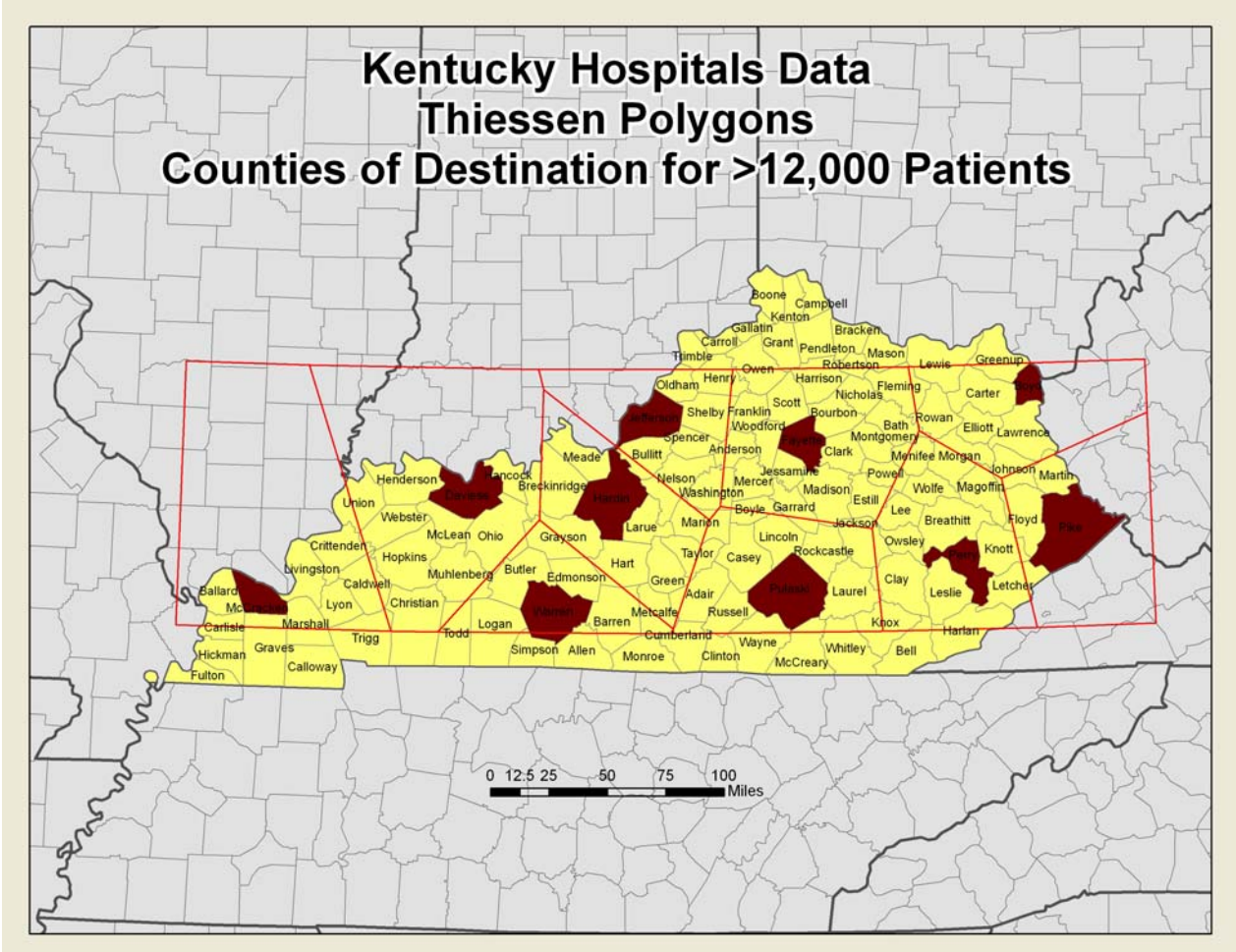
KHA Patient Origin Data Mapping



KHA Patient Origin Data Mapping

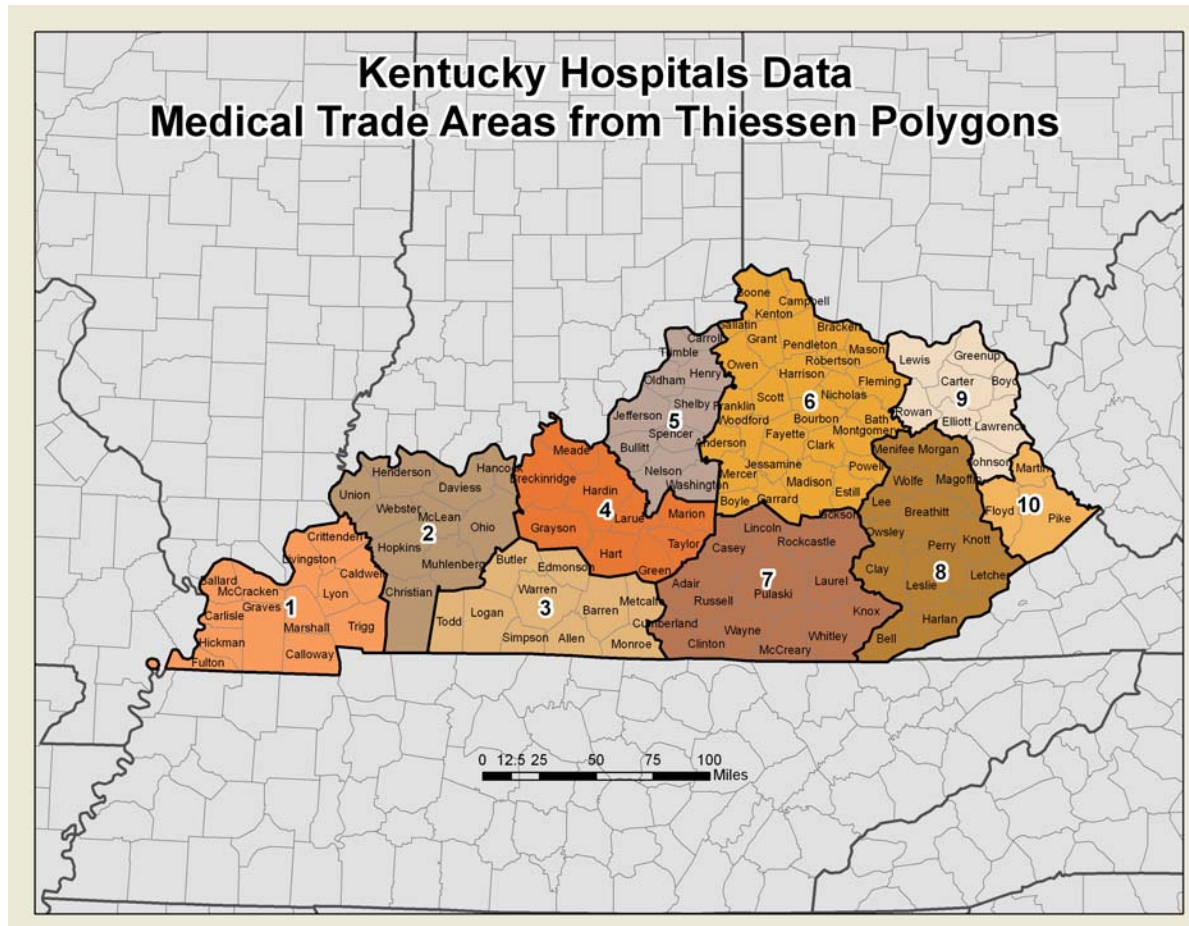


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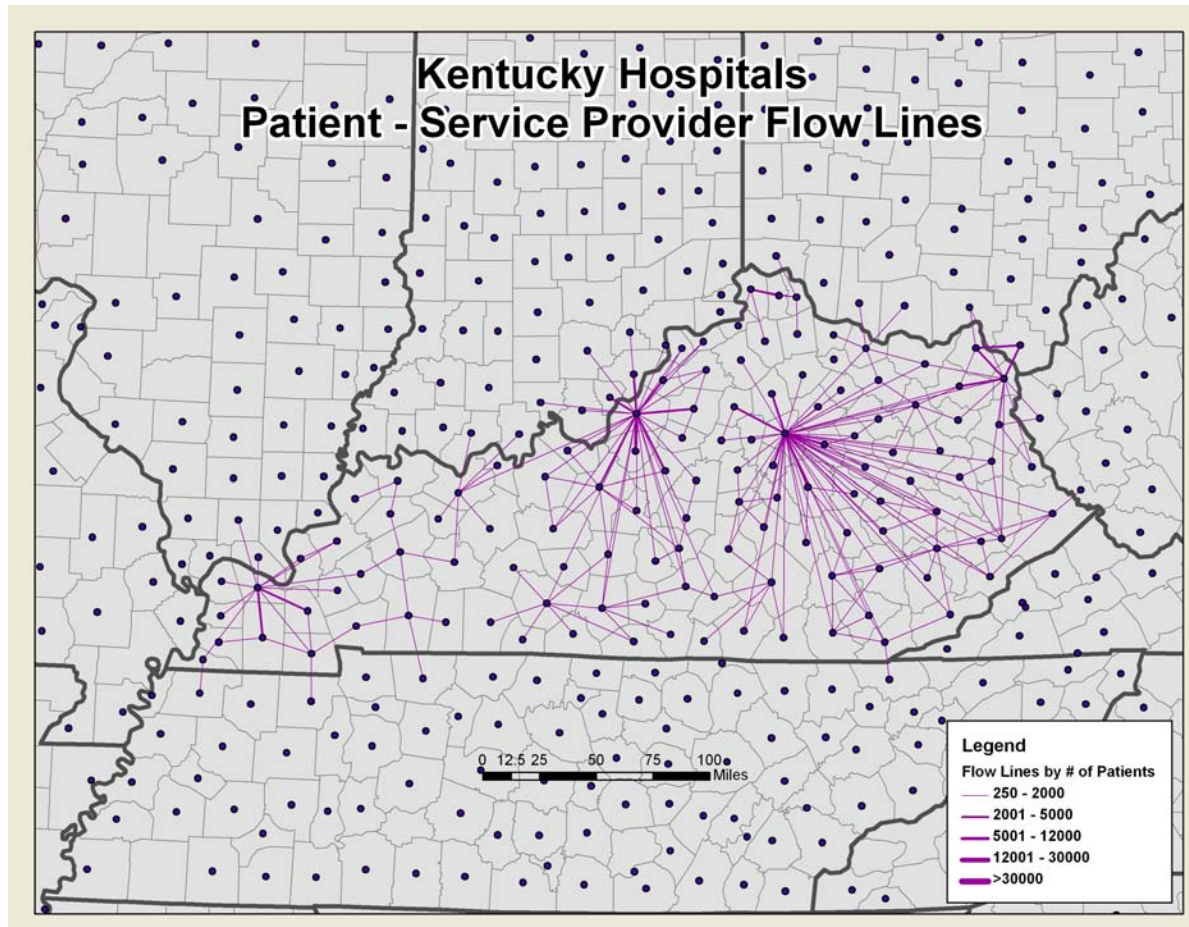
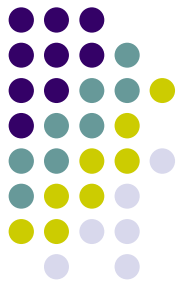
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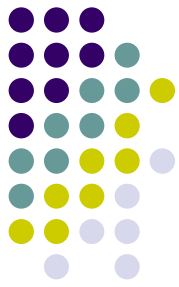
Thiessen Polygons



KHA Patient Origin Data

Patient Flows





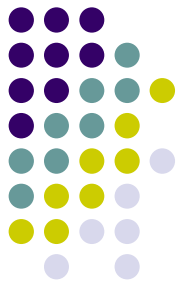
Next Steps – GIS Processing

- Obtain commercial insurance data
- Apply gravity model to entire study area using Medicaid data and examine spatial clustering of results
- Apply same methods to Kentucky Hospital Association and commercial insurance data
- Overlay results to develop final maps of MTAs



Next Steps – Administrative

- Obtain specific data sets from the commercial health insurers for the GIS mapping
- Refine claims data input as necessary
- Review the GIS mapping output with appropriate e-Health stakeholder groups
- Extend time table for completion of work to end of August



Questions?